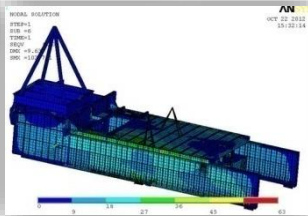
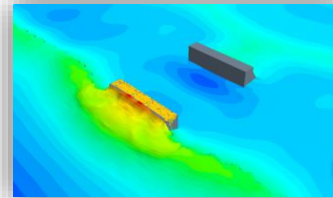
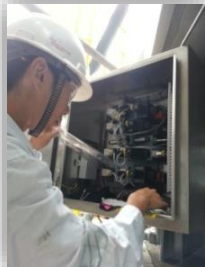
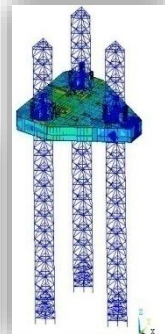


Keppel

Offshore Technology Development



An Offshore & Marine Solution Company

Subsidiary of Keppel Offshore & Marine

KEPPEL CORPORATION



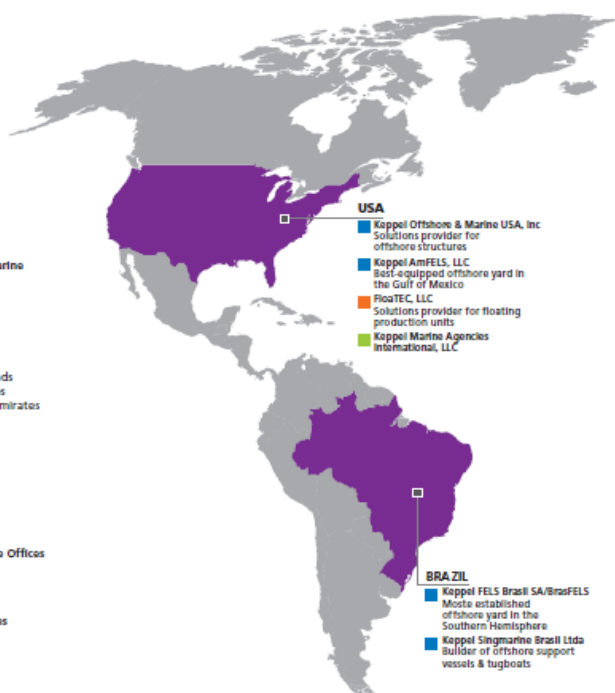
KEPPEL OFFSHORE & MARINE - GLOBAL OPERATIONS

Global network

Yards & Offices: Harnessing the synergy of 20 yards worldwide keeps us *Near Market, Near Customer.*

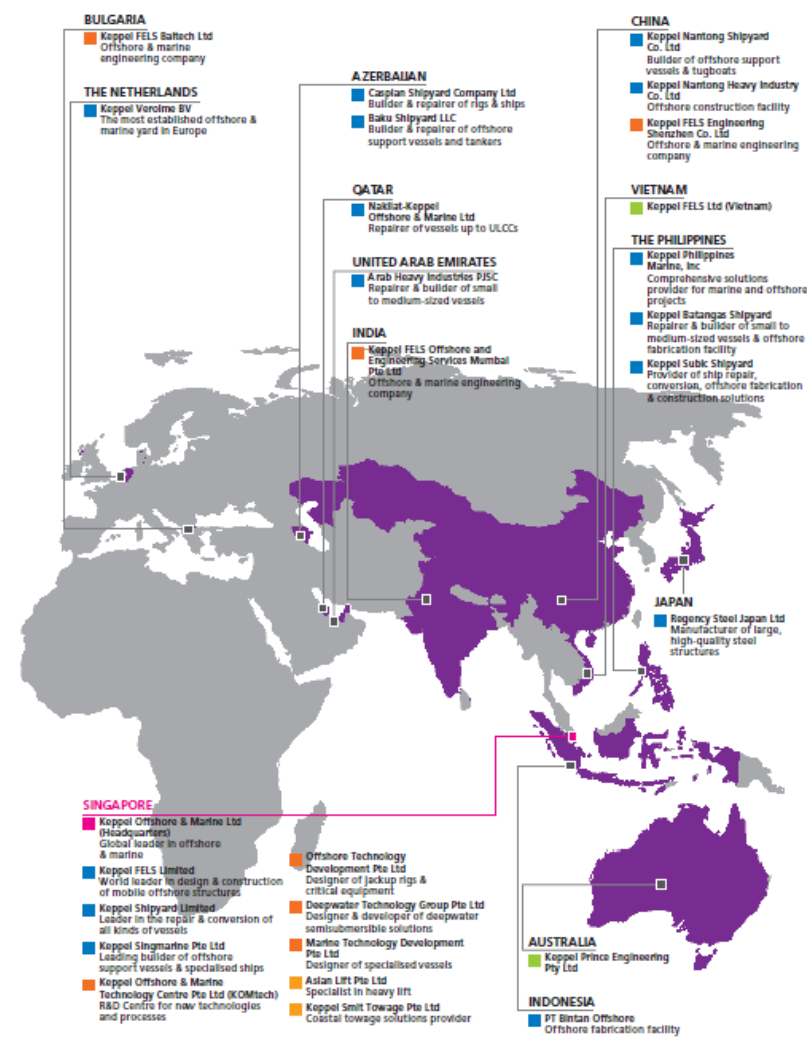
LEGEND

- **Headquarters**
Singapore
- **Offshore & Marine**
Azerbaijan
Brazil
China
Indonesia
Japan
Qatar
Singapore
The Netherlands
The Philippines
United Arab Emirates
USA
- **Engineering/ R&D Centre**
Bulgaria
China
India
Singapore
USA
- **Representative Offices**
Australia
USA
Vietnam
- **Marine Services**
Singapore



- USA**
- Keppel Offshore & Marine USA, Inc
Solutions provider for offshore structures
 - Keppel AmFELS, LLC
Best-equipped offshore yard in the Gulf of Mexico
 - FloaTEC, LLC
Solutions provider for floating production units
 - Keppel Marine Agencies International, LLC

- BRAZIL**
- Keppel FELS Brasil SA/BrasFELS
Most established offshore yard in the Southern Hemisphere
 - Keppel Singmarine Brazil Ltda
Builder of offshore support vessels & tugboats



- BULGARIA**
- Keppel FELS Baltech Ltd
Offshore & marine engineering company

- THE NETHERLANDS**
- Keppel Verolme BV
The most established offshore & marine yard in Europe

- AZERBAIJAN**
- Caspian Shipyard Company Ltd
Builder & repairer of rigs & ships
 - Baku Shipyard LLC
Builder & repairer of offshore support vessels and tankers

- QATAR**
- Nakilat-Keppel Offshore & Marine Ltd
Repairer of vessels up to ULCCs

- UNITED ARAB EMIRATES**
- Arab Heavy Industries PJSC
Repairer & builder of small to medium-sized vessels

- INDIA**
- Keppel FELS Offshore and Engineering Services Mumbai Pte Ltd
Offshore & marine engineering company

- SINGAPORE**
- Keppel Offshore & Marine Ltd (Headquarters)
Global leader in offshore & marine
 - Keppel FELS Limited
World leader in design & construction of mobile offshore structures
 - Keppel Shipyard Limited
Leader in the repair & conversion of all kinds of vessels
 - Keppel Singmarine Pte Ltd
Leading builder of offshore support vessels & specialised ships
 - Keppel Offshore & Marine Technology Centre Pte Ltd (KOMtech)
R&D Centres for new technologies and processes

- Offshore Technology Development Pte Ltd
Designer of jackup rigs & critical equipment
- Deepwater Technology Group Pte Ltd
Designer & developer of deepwater semisubmersible solutions
- Marine Technology Development Pte Ltd
Designer of specialised vessels
- Aslan Lift Pte Ltd
Specialist in heavy lift
- Keppel Smit Towage Pte Ltd
Coastal towage solutions provider

- CHINA**
- Keppel Nantong Shipyard Co. Ltd
Builder of offshore support vessels & tugboats
 - Keppel Nantong Heavy Industry Co. Ltd
Offshore construction facility
 - Keppel FELS Engineering Shenzhen Co. Ltd
Offshore & marine engineering company

- VIETNAM**
- Keppel FELS Ltd (Vietnam)

- THE PHILIPPINES**
- Keppel Philippines Marine, Inc
Comprehensive solutions provider for marine and offshore projects
 - Keppel Batangas Shipyard
Repairer & builder of small to medium-sized vessels & offshore fabrication facility
 - Keppel Subic Shipyard
Provider of ship repair, conversion, offshore fabrication & construction solutions

- JAPAN**
- Regency Steel Japan Ltd
Manufacturer of large, high-quality steel structures

- AUSTRALIA**
- Keppel Prince Engineering Pty Ltd

- INDONESIA**
- PT Bintan Offshore
Offshore fabrication facility

KEPPEL OFFSHORE & MARINE - CORPORATE PROFILE

Keppel Offshore & Marine is a global leader in ship repair and conversion, specialised shipbuilding, and offshore rig design, construction and repair.

We integrate and harness the experience and expertise of 20 yards and offices worldwide to optimise deployment of resources and effectively execute our *Near Market, Near Customer* strategy.

**KEPPEL OFFSHORE &
MARINE LTD**

Keppel FELS Limited

Keppel Shipyard Limited

Keppel Singmarine Pte Ltd

**Offshore Technology
Development Pte Ltd**

**Deepwater Technology
Group Pte Ltd**

**Marine Technology
Development Pte Ltd**



COMPANY PROFILE



**Offshore Technology
Development**

OTD COMPANY
STARTED SINCE 1994

LEAN & MEAN
COMPANY SETUP
60+ STAFF

LEADER IN
OFFSHORE &
MARINE INDUSTRY

ONE-STOP DESIGN &
ENGINEERING
CAPABILITIES &
ANALYSIS

OVER 100 VESSEL
DESIGNS OPERATING
WORLDWIDE

WITH 4,000
GEARBOXES ON
ORDER-TO-DATE

GLOBAL SOLUTION
SUPPORT, MEETING
HIGHEST
ACCREDITATION &
SAFETY STANDARDS.

QUALITY SYSTEM
ISO9001:2008
CERTIFICATION

**OFFSHORE
EQUIPMENT**

**MARINE
EQUIPMENT**

**SCADA
SYSTEM
&
RIG MOVE**

**DESIGN
&
ENGINEERING**

**AFTER
SALES
SERVICES**

OFFSHORE EQUIPMENT



ELECTRIC RACK & PINION JACKING SYSTEM **HYDRAULIC RACK & PINION JACKING** **HYDRAULIC CYLINDER JACKING SYSTEM**

- Cost-effective and reliable system solutions on 100 over vessels worldwide.
- Capable of lifting a load upwards of 93,600 kips.
- Designed and built in compliance with ABS/ DNV rules for self-elevating platforms/ vessel.

SELF POSITIONING FIXATION SYSTEM

- Being able to hold up to 25,000kips per leg chord.
- Automatic, minimises human intervention and reduces operation time.
- Designed and built in compliance with ABS/DNV rules for self-elevating jack up rigs



OFFSHORE EQUIPMENT



CONDUCTOR TENSIONER UNIT (PUSH) CONDUCTOR TENSIONER UNIT (PULL)

- Latest innovation in Conductor Tensioning Units using Hydraulic Tensioning Cylinders with a dedicated Hydraulic Power Unit (HPU) with an integrated control panel.
- Customisable to suit the customer's requirements.

OTD CATWALK

- Designed for a jack-up drilling rigs operating in an offshore environment.
- Automatic transfer of drilling and completion tubular from the cantilever pipe storage area to the mouse-hole and well centre pick-up positions on the drill floor.
- Improved rigs safety & capabilities.



OFFSHORE & MARINE EQUIPMENT

MOORING WINCH
ANCHOR WINCH
TRACTION & STORAGE
WATER FALL
RISER-PULLING
CHAIN JACKING

- Customised range of winches and fairleads solutions for jackup rigs and semi-submersible rigs
- Safe, Reliable, Easy Handling, Low Maintenance & Environmental Friendly.
- Designed and built in accordance to ABS/DNV .



LIFT & ROLL SYSTEM (HYDRAULIC)
HYDRAULIC CYLINDERS SKIDDING SYSTEM
ELECTRIC RACK & PINION SKIDDING SYSTEM
HYDRAULIC GRIPPER

- Track records of skidding massive structures of up to 3,700 tons
- Designed and built in compliance with Classification rules.

OFFSHORE & MARINE EQUIPMENT

GREASING SYSTEM

- Semi-automatic greasing system.
- Cost-effective
- Eliminates the need for manual greasing during every rack & pinion movement operation.



ELECTRONIC WEIGHING SYSTEM

HYDRAULIC WEIGHING SYSTEM

- Monitoring the weight of contents in tanks with the aid of electronic hydraulic load cells.
- Fulfilled the market's need of precision and immediate data monitoring of tank status.

OFFSHORE & MARINE EQUIPMENT



BULK TANK

SURGE TANK

AIR RECEIVERS

CYCLONE SEPARATORS

DUST COLLECTOR

- Customised Pressure Vessels design.
- Tailored for operations in harsh environments. Design pressures ranging from 45 to 165 psi. Operating temperatures from -10 to 100°C.
- Conforming to the latest edition of ASME Boiler and Pressure Vessel Code, to the rules and regulations of American Bureau of Shipping (ABS), Det Norske Veritas (DNV) and PETROBAS N-13 standards.

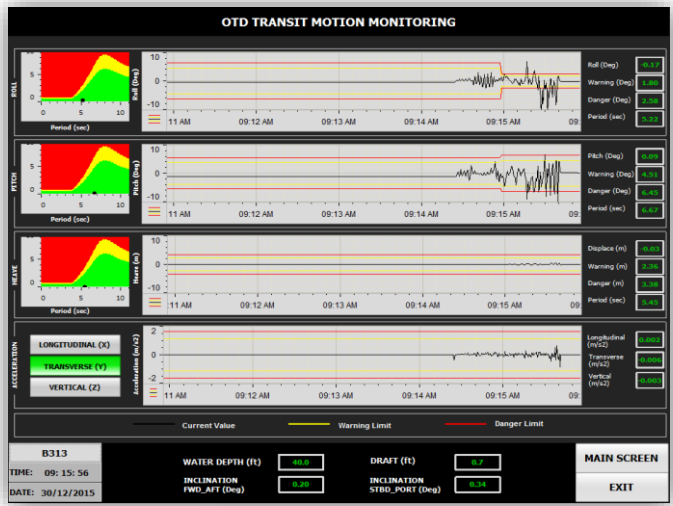
AZIMUTH THRUSTER

TUNNEL THRUSTER

- Joint-collaboration with ZF Marine Krimpen
- High quality and reliable

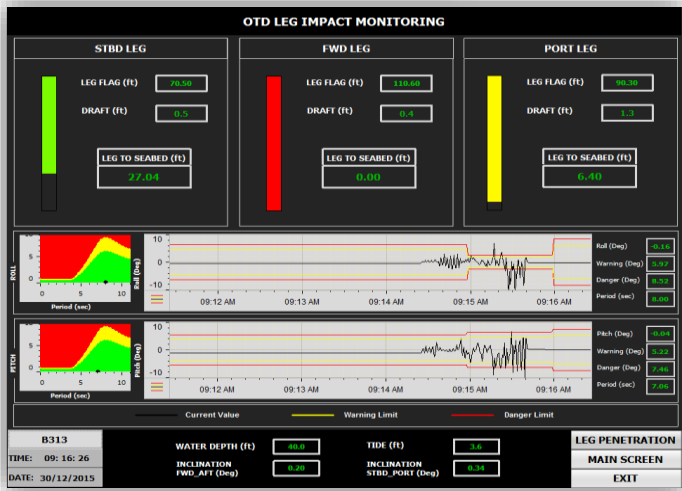


SCADA SYSTEM & RIG MOVE



VESSEL MOTION MONITORING

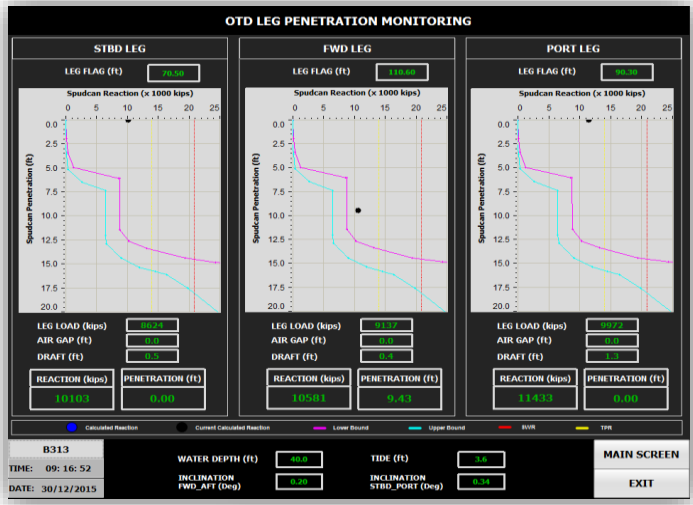
- Accurate monitoring of the vessel/platform motion during towing operation in the harsh sea environment.
- Real time comparison of vessel motion against the critical design limits.
- Adopts wireless communication for the sensors.
- Easy transfer and quick installation of the system on different vessels.



LEG IMPACT MONITORING

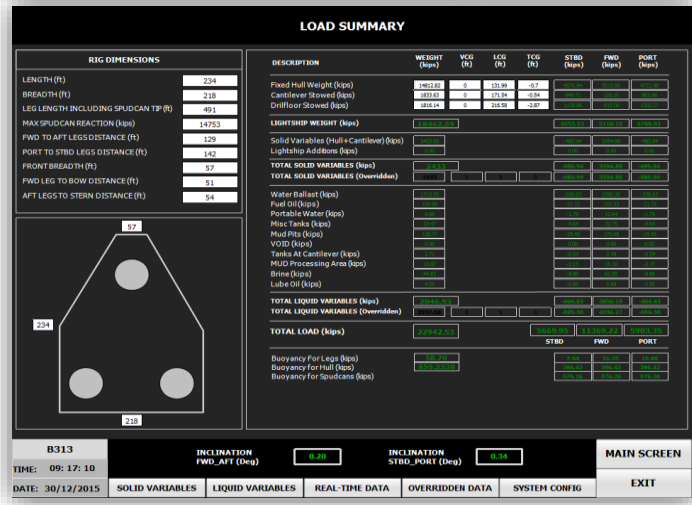
- Using high technology sensors to monitor the distance between leg bottom and seabed and alert the operator when the vessel motion is reaching the allowable limits.
- Adopts wireless communication for the sensors.
- Easy transfer and quick installation of the system on different vessels

SCADA SYSTEM & RIG MOVE



LEG PENETRATION MONITORING

- Using high technology sensors to monitor the leg reaction on each leg against the vessel penetration curves during preloading operation.
- Adopts wireless communication for the sensors.
- Easy transfer and quick installation of the system on different vessels



VESSEL STABILITY

- Capable of performing the calculation of loads exerted on the platform for any given operation.
- Generate comprehensive reports for the rig crew to efficiently plan their daily operation and execute their activities safely.

SCADA SYSTEM & RIG MOVE

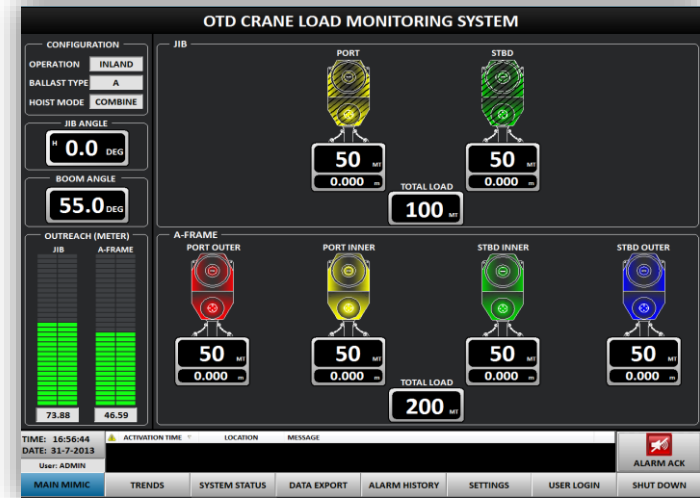


RPD MONITORING

- Designed to work with any type of jacking system as a stand alone system for new installation or retrofit projects.
- Utilises rotary sensors to track the travelling distance on each chord and simultaneously compute the RPD for each leg.
- Monitoring the Rack Phase Differential (RPD) to be within the STBD RPD allowable limits.



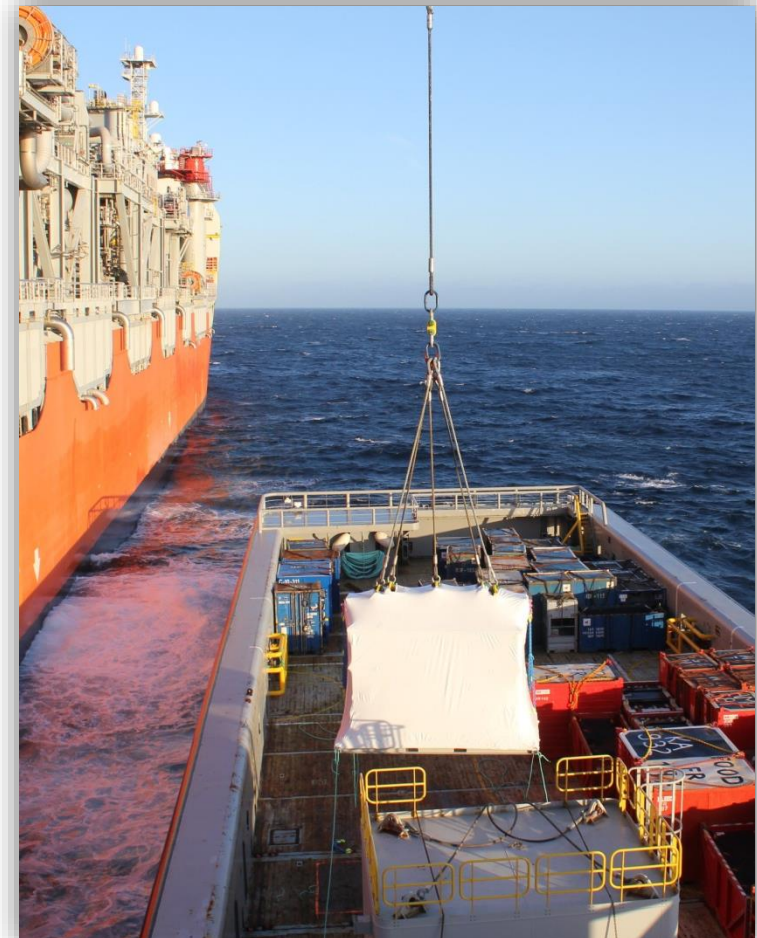
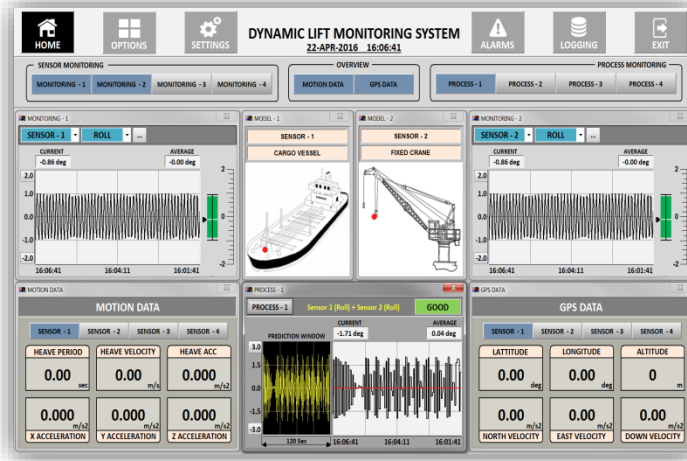
SCADA SYSTEM & RIG MOVE



CRANE LOAD MONITORING

- A complete customised solution applicable with any type of crane.
- Continuous tracking of the individual hoist load, computation of corresponding outreach and monitoring of total lifting load based on the design load limits .
- Ensuring continuous, smooth and safe lifting operation.

SCADA SYSTEM & RIG MOVE



DYNAMIC LIFT MONITORING

- Designed for transfer of cargo between ships or between floating and fixed platforms.
- Adopts wireless communication to provide real-time motion information of the primary and target vessels.
- Reduces load impacts and rope tensions during transfer.

STRUCTURAL ENGINEERING

GLOBAL HULL ANALYSIS

JACKING FOUNDATION DESIGN

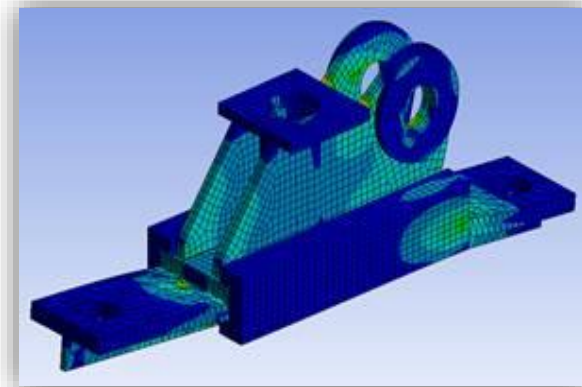
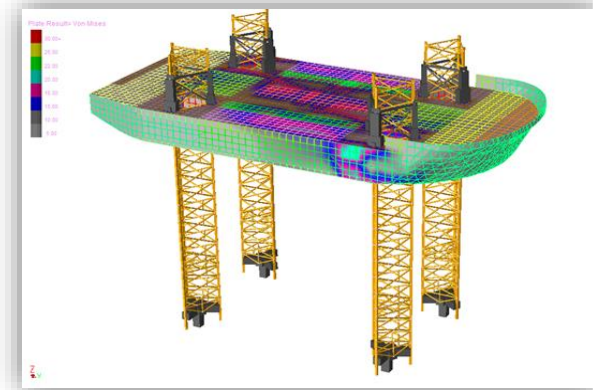
CANTILEVER DESIGN

EQUIPMENT FOUNDATION DESIGN

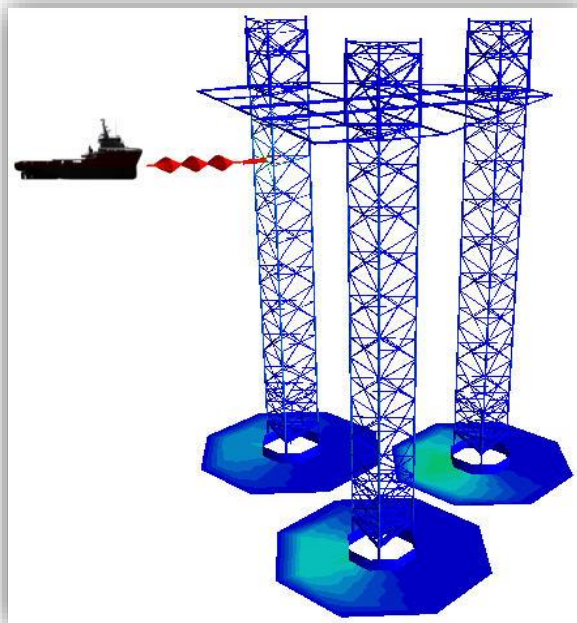
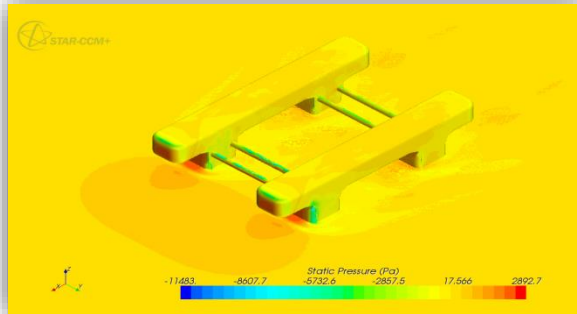
FINITE ELEMENT ASSESSMENT

ICE BELT REINFORCEMENT FOR POLAR CLASS VESSELS

- Offer global finite element analyses and designs using industry recognized software (ANSYS, SACS, SESAM etc.)
- Track record of in-house jack-up designs operating offshore



ADVANCED STRUCTURAL ENGINEERING



RACK PHASE DIFFERENCE (RPD) LIMIT ANALYSIS
FATIGUE ANALYSIS
BOAT IMPACT ANALYSIS
DROPPED OBJECT ANALYSIS
COMPUTATIONAL FLUID DYNAMIC (CFD) ANALYSIS
EXPLOSION RESPONSE ANALYSIS
EARTHQUAKE RESPONSE ANALYSIS
VIBRATION RESPONSE ANALYSIS
PUSH OVER ANALYSIS

- Provide optimised weight and cost-effective solution to operators without compromising on the safety of offshore structures.
- Accurate simulation using CFD enable cost-effective design solution for complex problems (prediction of environmental loads, resistance and propulsion, sea keeping and maneuvering, industrial multiphase flow etc).

NAVAL ARCHITECTURE

HULL FORM AND AFLOAT STABILITY

WIND HEELING MOMENT CALCULATION

HYDROSTATIC & TANK TABLE

WATERTIGHT SUBDIVISION

GENERAL ARRANGEMENT PLAN FOR JACK-UP VESSELS

CARGO PLAN FOR WIND TURBINE VESSELS

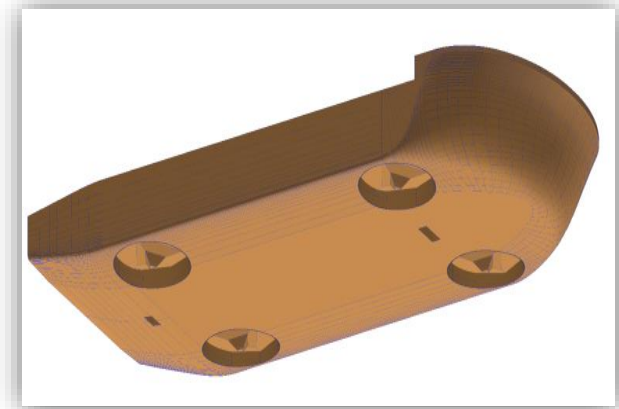
BOLLARD PULL CALCULATION FOR TOWING

MOORING FORCE CALCULATION

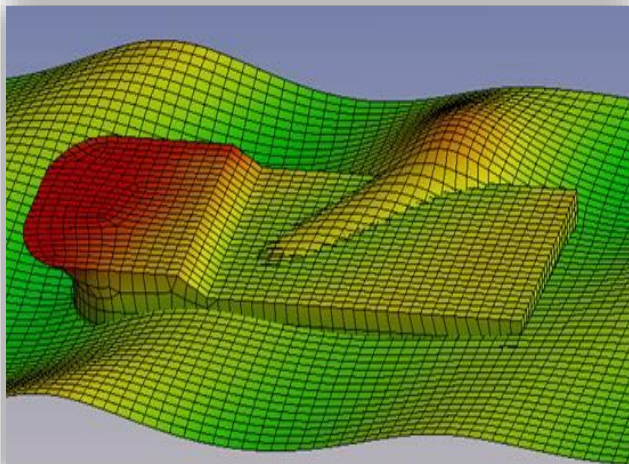
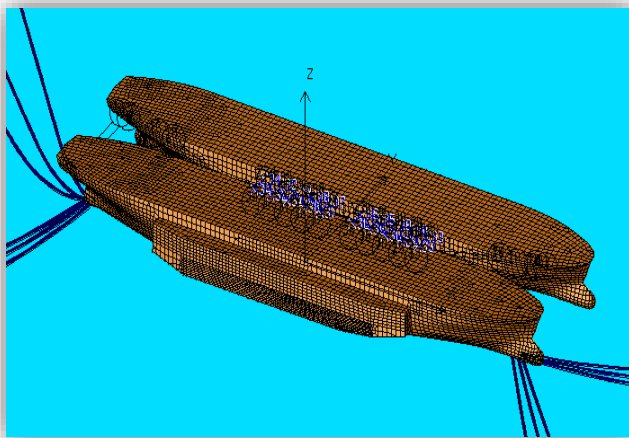
PROBABILISTIC DAMAGE STABILITY FOR SPS NOTATION

BALLAST WATER MANAGEMENT PLAN

- Team of naval architects with established reputation and experience in jack-up, wind installation and naval markets
- Track record of designs with minimal watertight compartments and jack-ups with long legs in fully retracted position
- Proficiency in NAPA software for customized stability for SPS vessels and jack-ups, probabilistic damage stability, stability of offshore units and lift boats



HYDRODYNAMIC ANALYSIS



WAVE EXCITATION FORCE COMPUTATION

- Well-equipped to determine loads experienced on both fixed and floating bodies to meet customer needs

MOTION ANALYSIS

- Accurately predict motion performance of new vessel designs allowing early hull shape assessments

GREEN WATER ANALYSIS

OFFLOADING MOORING ANALYSIS

DP CALCULATION

PROPULSION AND RESISTANCE CALCULATION

SPEED AND POWER PERFORMANCE PREDICTION

CAVITATION PERFORMANCE PREDICTION

VIRTUAL TESTING, VALIDATION AND OPTIMIZATION

CAPTIVE MANEUVERING TESTS BY CFD SIMULATIONS

OVERVIEW

“OTD Aftersales Service Team strive to deliver the best value and services **FOR YOU**”

Enhanced Service

- Product training
- Rig move
- Parts sales
- Periodic inspection
- Motor brakes inspection
- Winch inspection
- Fixation inspection
- Pinion Inspection
- Gearbox overhaul package

Specialised Inspection

- Drone Inspection
- Borescope Inspection
- Thermographic Inspection
- Vibration Inspection
- PAUT Inspection
- Laser 3D Scan (upcoming)
- ROV (upcoming)

Hardware Development

- Rig Move Monitoring System
- EMS Monitoring System Upgrade
- Drone Tools
- Confined Space Drone
- Ballast Water Treatment System

SPECIALISED INSPECTION (DRONE)

- DERRICK STRUCTURAL AND DROPS INSPECTION**
- LEG CHORD & RACK INSPECTION ANODES DROPS SURVEY**
- HELIDECK TRUSS INSPECTION**
- CRANE INSPECTION**
- SIDE-SHELL & UNDERDECK INSPECTION**
- LIVING QUARTERS INSPECTION**



- **Unmanned Aerial System ('drone') Data Collection**
 - HD video & stills
 - Thermal imaging
 - Gas detection
 - In-tank inspection
 - 3-D imaging
- **Screens & Processes data**
 - Defect size measurement
- **Builds 3-D engineering model**
- **Analyses potential problem areas and advices client**
 - Fitness-for-Service
 - Residual strength
 - Remaining life
 - Work scope for next yard visit
- **Designs repair(s) if necessary**
- **Uploads all to web portal**



SPECIALISED INSPECTION (BOROSCOPE)



JACKING GEARBOXES
GEARBOXES
MAIN GENERATOR/TURBO-CHARGER
ALTERNATORS
PIPES INTERNAL
WINCH GEARBOXES
LIFE BOAT GEARBOXES

- Provide detailed checks on areas normally inaccessible from usual standard inspection methods without affecting the integrity of the machinery.
- Accurate report assessments and right health inspection assessment to your valuable assets

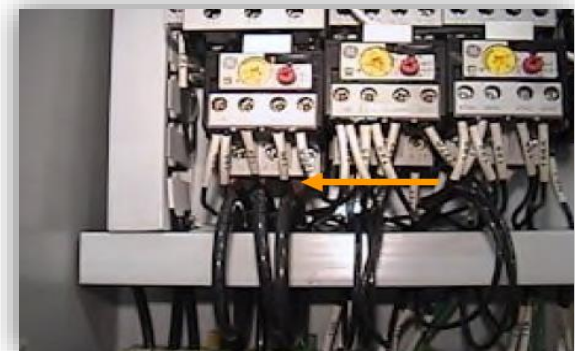


SPECIALISED INSPECTION (THERMOGRAPHY)



ABNORMAL HEATING
IMPROPER INSTALLATION AND TERMINATION
COMPONENT OVERHEAT
OVERLOAD CIRCUIT AND CABLES
IMPROPER ALIGNMENT
COMPONENT ABRASION AND RESISTANCE

- Specially trained OTD Thermo graphic inspectors, supported by Design and Analysis engineers
- Provide inspections, immediate troubleshooting and result evaluation to carry out system design/analysis assessment

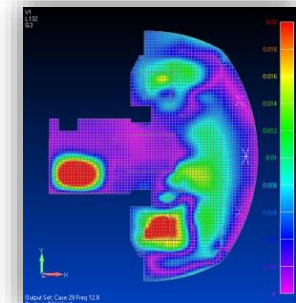
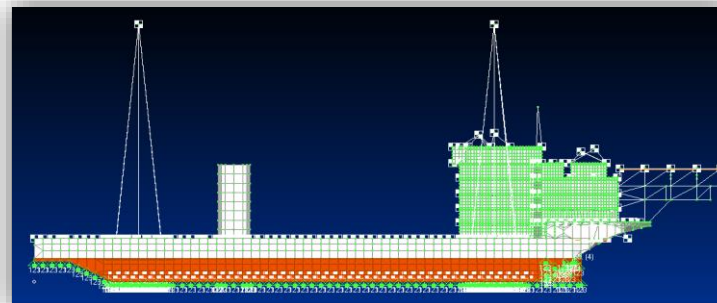


SPECIALISED INSPECTION (VIBRATION)

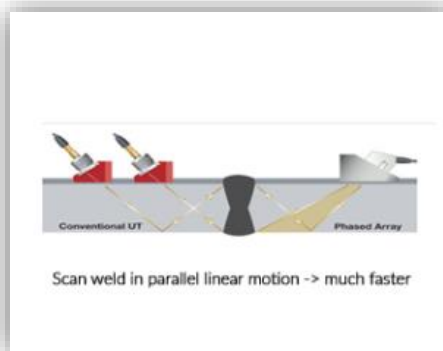


ABNORMAL VIBRATION
IMPROPER ALIGNMENT
OUT-OF-BALANCE
OUT-OF-TOLERANCE
RUBBING CONTACTS

- OTD aftersales vibration team with full engineering capabilities
- Provide full coverage on your vibration needs from Vibration Measurement, Vibration Engineering Analysis to Global Vibration Analysis.

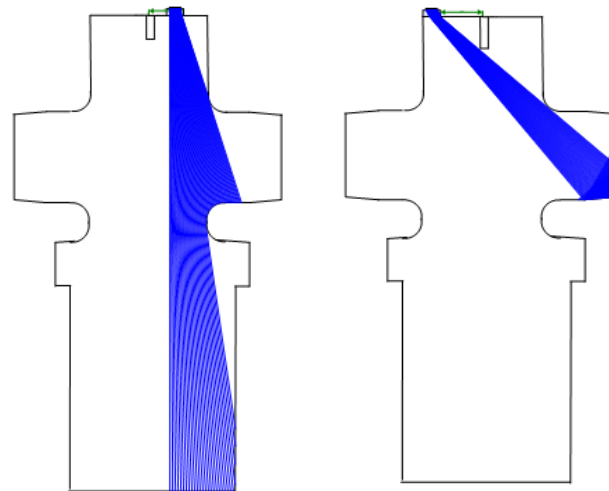
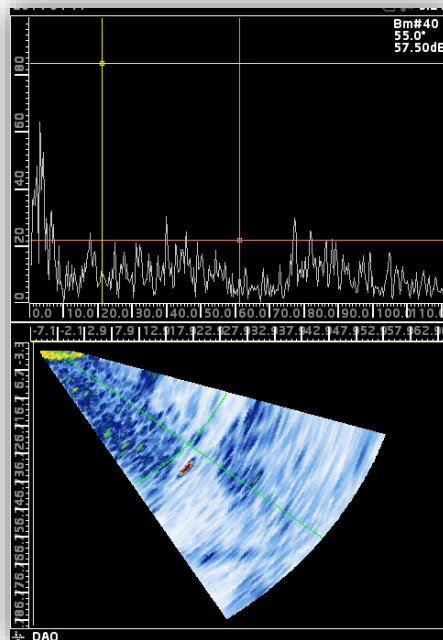


SPECIALISED INSPECTION (PAUT)

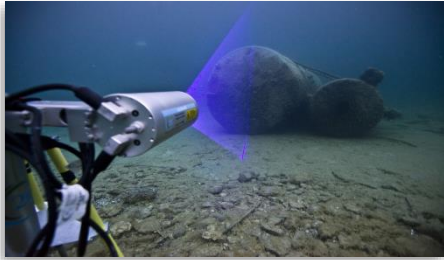


NON DESTRUCTIVE TESTING INSPECTION OF WELDS THICKNESS MEASUREMENTS FLAW DETECTION

- OTD aftersales PAUT team makes use of the latest high definition scanners and post processing software to provide a complete evaluations of your areas of need.

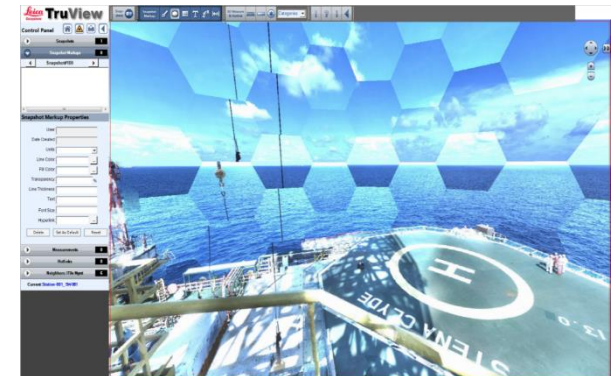
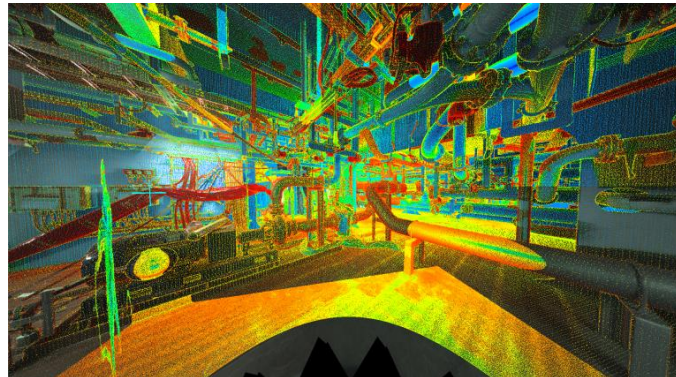


3D LASER SCAN + ENGINEERING SERVICES



ENGINEERING UPGRADE PACKAGE INTERFERENCE CHECK ASSET MANAGEMENT/MONITORING JOB SURVEY

- OTD aftersales 3D laser team utilised latest 3D scanning tools + data processing technology that able to deliver one stop solution for our valuable customer from asset data collection, processing, analysing, engineering, fabrication, installation and data management.

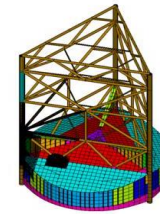


OTD QUALITIES

**EFFICIENT
PROJECT
MANAGEMENT**



**INNOVATIVE
DESIGNS**



**DEEP INDUSTRY
KNOWLEDGE**



**DETAIL
ENGINEERING**

**RELIABLE
PARTNER CHAIN**



**QUALITY
ASSURANCE**



**PROFESSIONAL
TECHNICAL
SUPPORT**

**ONE-STOP
TOTAL SERVICE**

OUR CLIENTS



FTS Derricks Pte Ltd



ارامكو السعودية
Saudi Aramco



TS OFFSHORE LIMITED



oro negro | x
Oro Negro Laurus Pte Ltd



Keppel

Offshore Technology Development



55 Gul Road, Singapore 629353

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Support: support.otd@keppelotd.com